



AMES RESEARCH CENTER

National Aeronautics and Space Administration

Ames Research Center, Moffett Field, California 94035-1000

415-604-9000

STRATOSPHERIC OBSERVATORY FOR INFRARED ASTRONOMY (SOFIA)

NASA's next-generation airborne observatory for infrared astronomy is in the development stages. SOFIA is a joint project of NASA and the German space agency, DARA. It is being created and will be operated by a team of scientists, engineers and educators as part of a privatized consortium led by the Universities Space Research Association (USRA), Columbia, Maryland. A number of prominent German companies are developing the 'heart' of the science platform -- its telescope. The observatory will begin its science and educational mission with first flights scheduled for the year 2001.

SOFIA is a converted Boeing 747-SP aircraft, modified to accommodate a 2.5 meter (100-inch) diameter mirror that will make it, by far, the largest airborne telescope in the world. It will observe the heavens from the cold, dry fringes of Earth's atmosphere, above 41,000 feet. From its unique vantage point above more than 99% of the atmosphere's obscuring water vapor, SOFIA will make observations that are impossible for even the largest and highest of ground-based telescopes. It will enable astronomers to answer important questions about the birth of stars, the formation of solar systems, the origins of complex molecules in space, the nature and evolution of comets, and even the nature of the mysterious black holes lying at the centers of some galaxies, including our own.

Based at Moffett Federal Airfield near San Jose, California, SOFIA will make an estimated 120 research flights per year. More than 80 scientists, engineers, aircrews, and technicians will eventually be required to operate and maintain the aircraft, telescope, computers, and associated instruments. Eventually, SOFIA will host at least 60 research teams from the United States, Germany, and other countries.

A New Chapter in a Distinguished History

SOFIA is the latest in a line of airborne observatories dating back to 1966, when NASA began experimenting with a small infrared telescope aboard a Lear Jet. The Kuiper Airborne Observatory (KAO), a modified C-141 jet transport carrying a 0.91 meter (36-inch) diameter telescope, operated from 1974 to 1995, and made many important observations, including the first views of the faint rings of Uranus, the gigantic impact of Comet Shoemaker-Levy on Jupiter, and the discovery of rings of dust orbiting the center of our galaxy.

With its larger telescope and more efficient optics, SOFIA will be able to see objects many times fainter than those visible to the KAO, and make observations up to 60 times faster, giving astronomers much better access to the universe than ever before.

The SOFIA airborne observatory is specifically designed to complement both ground-based infrared telescopes -- which can be made larger -- and satellite-based infrared telescopes -- which have limited lifetimes. By using all three types of systems to their best advantage, SOFIA will achieve almost complete coverage of the infrared spectrum, according to the Observatory's director

A New Era in NASA -- Private Sector Cooperation

As part of NASA's drive to lower costs and improve efficiency by involving the private sector, the SOFIA observatory will be developed and operated for NASA by a team of highly experienced corporations, universities, and private non-profit institutions. Overall program control is in the hands of NASA's Ames Research Center, in Mountain View, CA.

USRA is the prime NASA contractor. A private non-profit corporation with 80 universities and colleges as institutional members, USRA was formed 28 years ago under the auspices of the National Academy of Sciences to provide a mechanism through which universities, the government, and other organizations can cooperate effectively to further space science and technology and promote education in those areas. USRA has overall project management responsibility for developing SOFIA and will also conduct the scientific operations of the observatory.

The extensive and highly complex modifications to the 747 will be made by Raytheon E-Systems of Waco, Texas, which has completed hundreds of large aircraft modifications, including NASA's space shuttle transport plane. Raytheon will engineer the critical open telescope cavity and other structural modifications, and will design and install the complex on-board hardware and software necessary to operate the observatory effectively. The Scientific Systems Division of Sterling Software will be Raytheon's main subcontractor for the crucial communications and control software. Sterling is a long-time NASA contractor, with years of direct experience designing and operating computer systems for the Kuiper Airborne Observatory.

The SOFIA aircraft will be operated and maintained by United Airlines, the world's largest airline. Specially trained pilots will fly SOFIA, and it will be maintained and serviced at United's extensive maintenance facilities in San Francisco and Oakland. When research needs dictate that SOFIA operate away from California, it will have access to United's global network of maintenance stations. UAL also supplied the aircraft to NASA from its fleet of meticulously-maintained 747s.

Science input into the development and operation of SOFIA will come from the USRA team and several campuses of the University of California, particularly UCLA and Berkeley. Other universities and research labs, both in the United States and Germany, will design and develop instruments for SOFIA's telescope.

SOFIA's extensive education and public outreach programs will be conducted by an alliance of two world-renowned astronomy organizations -- the Astronomical Society of the Pacific, a world-wide society of astronomers and astronomy educators, and the SETI Institute, devoted to both research and education in astronomy.

The Telescope -- International Cooperation in Action

Modern science is truly global in nature, and SOFIA perfectly exemplifies the international nature of cooperation in astronomical research. DARA, Germany's space agency, is a key participant in the SOFIA program, cooperating with NASA under a Memorandum of Understanding. The all-important 2.5 meter telescope, with its unique aircraft-capable mounting and control system, is being built in Germany. DARA has contracted the work to three of the world's most experienced aerospace technology companies, MAN GHH, Kayser-Threde GmbH, and MAN Technologies. These companies will design and build the telescope, and ship it to Texas for installation in SOFIA. In return for providing the heart of the observatory and some operational support, German scientists will have access to a portion of SOFIA's observing time.

A Unique Educational Opportunity

In any major publicly-funded observatory, the need to ensure excellent quality in scientific research must be the most important concern. SOFIA is no exception to that rule. But, more than just about any other observatory, SOFIA will be accessible to students, educators, and anyone else interested in learning how scientists use advanced technology to contribute to our knowledge of the universe.

Hundreds of teachers and students from across the country and around the world will have the opportunity to fly on SOFIA research missions, personally observing and even participating in research as it happens. Thousands more will participate in SOFIA research via the internet and world wide web, through classroom visits by SOFIA astronomers, by conducting SOFIA-related activities in their classrooms, by seeing programs about SOFIA astronomy at their local planetarium, or by visiting special interactive exhibits at their local science museum.

These extraordinary educational opportunities are made possible by NASA policies which, more than ever before, encourage and support communicating the excitement, value, and benefits of scientific research to all Americans.

For further information, contact

NASA Ames Research Center

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